

REMARKS

Claims 301 and 312 are amended to clarify the steps in the method.

Submission of Priority Documents

Certified copies of the priority documents for this case were submitted in connection with U.S. Application 09/929,754, which is co-pending. Applicants request that the Examiner access those certified copies in U.S. Application 09/929,754.

Those documents are:

Japanese Patent Application No. 7-099425 (March 20, 1995) ✓
Japanese Patent Application No. 7-117600 (April 6, 1995) ✓
Japanese Patent Application No. 7-182019 (June 14, 1995) ✓
Japanese Patent Application No. 7-182020 (June 14, 1995) ✓
Japanese Patent Application No. 7-205019 (July 8, 1995) ✓
Japanese Patent Application No. 7-326167 (November 9, 1995) ✓
Japanese Patent Application No. 7-354649 (December 22, 1995) ✓

Rejections Based on 35 U.S.C. 112, second paragraph

Regarding claims 301 and 312, Applicants respectfully submit that the terms "a composite" and "a surface" in the body of the claim are not made unclear by use of the same terms in the preamble. The phrase "providing a composite with a surface" in the body of claims 301 and 312 can be interpreted in only one way -- to provide some composite that has a surface. This is interpretation is not confused by it being the first step in "a method of preventing or reducing fogging of a surface of a composite."

Claims 308 and 320 have been rejected based on the Examiner being unclear as to how the photocatalytic material can effect water and contact angle on the surface if it is covered over by a protective layer. Applicants respectfully submit that this is not a valid basis for a 35 U.S.C. 112 rejection. There is no requirement in 35 U.S.C. 112, second paragraph, that one understand how the invention functions. Rather, Section 112, second paragraph, requires only

that the claims particularly point out and distinctly claim the invention, which claims 308 and 320 do.

The Examiner asserts that "less than about" in claim 312 is a contradictory term. Applicants respectfully disagree. In fact, this phrase is found in the claims of over 38,000 patents issued in the past 27 years (according to an online search using the USPTO website). Furthermore, since the Examiner's own remarks indicate that both "less than" and "about" are unambiguous when used individually, the Examiner is requested to explain how they are ambiguous when used together in the phrase "less than about."

The limitation added by new claims 325 and 328 is supported by the first paragraph of Example 4 at page 34, lines 23-30, which discloses a coating formed by calcining a titanium chelate solution, with no other coating components disclosed. The limitation added by new claims 326 and 329 is supported by the Example 2 at page 32, lines 23-29, which discloses a coating comprising titania bound by silica.

Rejections Based on Judicially Created Doctrine of Obviousness-Type Double Patenting

The obviousness-type double patenting rejection is over U.S. Patent No. 6,013,372, which is owned by the same party as the subject application. Applicants agree to submit a terminal disclaimer to address the rejection.

Rejections Based On 35 U.S.C. 103(a)

The Examiner has rejected the pending claims under Section 103(a) as obvious. At the outset, the Applicants note that the alleged obviousness of these claims is undercut by secondary considerations of nonobviousness. In this regard, the claimed technology has been licensed to certain companies throughout the world, including glass manufacturers Pilkington PLC and PPG Industries, who are preparing to manufacture products according to the technology. (See, e.g., article from Business Week magazine submitted herewith.) These secondary considerations support withdrawal of the Examiner's rejections.

35 U.S.C. 103(a) Rejections Relating to Claim 301

Claim 301 relates to a method of preventing or reducing fogging of a surface. Claim 301 recites subjecting a photocatalytic layer to photoexcitation to render the surface not only hydrophilic but sufficiently hydrophilic to yield a contact angle with water of less than 10 degrees. Claim 301 is amended to further recite subjecting the composite to humidity that is sufficient to induce fogging of the substrate if the photocatalytic surface layer were absent.

The invention as defined in claim 301 is not disclosed by any of the cited references. Specifically, U.S. Patent No. 3,640,712 to Field does not disclose subjecting the composite to humidity that is sufficient to induce fogging, nor does Field disclose effecting a contact angle of less than 10 degrees to prevent the fogging. Field's method relates to attaching pigments to film (col. 4, line 74 to col. 5, line 17). The method disclosed by Field to impart an image to film would not motivate a skilled person to reduce fogging of a surface. Especially, the method of Field would not motivate a skilled person to provide sufficient humidity to induce fogging and to reduce the contact angle to under 10 degrees to prevent that fogging, as claim 312 recites.

Besides failing to disclose or suggest all the limitations of claim 301, Field relates to the totally nonanalogous art of producing an image on a medium (col. 1, lines 6-7). As the Examiner states, "Field et al's purpose is other than creating anti-fogging conditions." (Item 7, third paragraph) Therefore, Field cannot be relied on as a basis for rejection. "In order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, reasonable pertinent to the particular problem with which the inventor was concerned." In re Oeteker, 977 F.2d 1443, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992); see also In re Deminski, 796 F.2d 436, 230 USPQ 313 (Fed. Cir. 1986); In re Clay, 966 F.2d 656, 659, 23 USPQ2d 1058, 1060-61 (Fed. Cir. 1992); MPEP §2141.01(a).

JP Patent 1978-149281 to Hiroshi Okaniwa et al. does not disclose a method of preventing or reducing fogging of the surface of a composite.

EPO 590,477 to Ogawa et al. is not related to fogging. Rather, the method of Ogawa is related to photocatalytically decomposing contaminants (col. 6, lines 1-3). Furthermore, Ogawa does not suggest rendering the surface hydrophilic (through choice of structure or irradiation time) especially with a contact angle of under 10 degrees as claimed. In fact, doing so would render the surface of Ogawa less adherent to contaminants and thus less suitable for its intended purpose (according to Ogawa) of photocatalytically decomposing the contaminants.

Furthermore, the contaminant decomposing method of Ogawa would not motivate a skilled person to subject a surface to humidity sufficient to induce fogging and to reduce the contact angle to under 10 degrees to prevent that fogging.

U.S. Patent No. 5,547,823 to Murasawa et al. does not disclose or suggest a method of reducing fogging as claimed. Rather, the method of Murasawa relates to "decomposition of deleterious materials" (col. 1, lines 47-51). Murasawa does not disclose the claimed limitations relating to hydrophilicity, contact angle under 10 degrees, fogging, and subjecting to humidity. There is no motivation from Murasawa to render a surface hydrophilic. Doing so would render the surface less adherent to the contaminants and thus less suitable for its intended use (according to Murasawa) of photocatalytically decomposing the contaminants. Nor would Murasawa's method of "decomposition of deleterious materials" provide any motivation to subject a surface to humidity sufficient to induce fogging and to reduce the contact angle to less than 10 degrees to prevent that fogging. Murasawa's surface would not be inherently hydrophilic, because Murasawa's method would work better with a hydrophobic surface (as explained above) and this is achieved through choice of raw material composition, application method, firing characteristics, and irradiation conditions.

U.S. Patent No. 5,616,532 to Heller does not disclose or suggest a method of reducing fogging. Rather, the method of Heller relates to "removal of contaminants from a fluid" (col. 11, lines 50-53). Heller does not disclose the claimed limitations relating to hydrophilicity, contact angle under 10 degrees, fogging, and subjecting to humidity to induce fogging. In fact, Heller teaches away from rendering a surface hydrophilic by prescribing a binder that renders the surface hydrophobic even when irradiated, so that the surface will "extract organic molecules from fluid, e.g., air or water, concentrating these organic on the coated surface" so that "the organic molecules ... can rapidly diffuse in the coating" (col. 9, 65 to col. 10, line 4). Regarding contact angle, Heller teaches away from the claimed contact angle range of under 10 degrees by stating that the hydrophobic binder preferably increases the contact angle to such an extent that the contact angle is preferably about 90-180 degrees. (col. 9, lines 51-56). Furthermore, Heller's contaminant removal method would not motivate the skilled person to subject a surface to humidity sufficient to induce fogging and to reduce the contact angle to less than 10 degrees to prevent that fogging as claim 301 is amended to recite. Heller's surface would not be inherently hydrophilic, because Heller's method would attract contaminants better with a hydrophobic

surface (col. 9, 65 to col. 10, line 4) and this is achieved through choice of raw material composition, application method, firing characteristics, and irradiation conditions.

The Examiner offers to remove the abstracts of Nissan Motor Co. LTR (09-227155 and 09-227158) and Toyota Motor Corp. (Suzuki et al) as references if Applicants supply a certified translation of the priority application PCT/JP96/00733, and if the PCT application contains all the limitations of the rejected claims. Accordingly, a certified translation of the PCT application is being obtained.

Fukayama relates (as acknowledged by the Examiner) to "environmental purification" to "decompose very small amount of pollutant in a living space" (page 1102, first paragraph). This is totally unrelated to preventing fogging. From the pollutant decomposition method of Fukayama, there is no motivation to subject a surface to humidity sufficient to induce fogging (as claim 301 is amended to recite). Nor is there motivation to render the surface hydrophilic, especially with a contact angle under 10 degrees, in order to prevent that fogging (as claim 301 is amended to recite). Applicants expect that the amendments to claim 301 overcome the Examiner's finding of "no apparent difference between structures produced by Fukayama et al's process, and those of applicant's claims."

In summary, none of the references disclose or suggest all of the limitations of claim 301 as amended. Therefore, claim 301 is patentable over the prior art.

35 U.S.C. 103(a) Rejections Relating to Claim 312

Claim 312 is directed to a method of maintaining a surface clean of deposits and contaminants. Claim 312 recites photoexciting a photocatalytic layer to render the surface hydrophilic, and sufficiently hydrophilic such that the contact angle with water is reduced to less than about 20 degrees. Claim 312 is amended to further recite subjecting the surface to deposits or contaminants, and rinsing the deposits or contaminants off the surface with water.

The invention as defined by claim 312 is not disclosed by any of the cited references. Specifically, Field does not disclose a contact angle under 20 degrees, nor the step of subjecting the composite to deposits or contaminants, nor the step of rinsing the deposits or contaminants off the surface with water. The method disclosed by Field of affixing a colloidal pigment to a hydrophilic surface (col. 4 lines 74-75) actually teaches away from maintaining the surface clean from deposits and contaminants as recited in claim 312.

Besides failing to disclose or suggest all the limitations in either claim 301, Field relates to the totally nonanalogous art of producing an image on a medium (col. 1, lines 6-7). Therefore, Field cannot be relied on as a reference, according to case law and MPEP 2141.01(a), as explained above.

Okaniwa does not disclose or suggest the claimed limitation of maintaining a surface clean from deposits and contaminants. In fact, Okaniwa teaches away from this limitation by stating that hydrophilifying the surface improves adhesion and printability. (page 3, lines 29-30) Okaniwa further does not disclose the limitations relating to a contact angle under 20 degrees, nor the step of subjecting the surface to deposits or contaminants, nor the step of rinsing the deposits off the surface with water.

Ogawa does not disclose the claimed range of under 20 degrees. Ogawa, like Heller described above, removes contaminants by photocatalytically decomposing them while they adhere to the surface (col. 5, 52 to col. 6, line 18). Rendering the surface hydrophilic (as recited in claim 312) would render the surface less adherent to contaminants and thus less suitable for its intended use (by Ogawa) of photocatalytically decomposing the contaminants.

Murasawa relates to photocatalytically "decomposition of deleterious materials" (col. 1, lines 47-51). In contrast, claim 312 relates to rinsing the deposits or contaminants off the surface with water. Murasawa does not disclose the claimed limitations relating to hydrophilicity, contact angle under 20 degrees, or rinsing the deposits off the surface with water. There is no motivation from Murasawa to render the surface hydrophilic. There is no motivation from Murasawa to render a surface hydrophilic. Doing so would render the surface less adherent to the contaminants and thus less suitable for its intended use (according to Murasawa) of photocatalytically decomposing the contaminants. Murasawa's surface would not be inherently hydrophilic, because Murasawa's method would work better with a hydrophobic surface (as explained above) and this is achieved through choice of raw material composition, application method, firing characteristics, and irradiation conditions.

Heller relates to photocatalytically decomposing organic contaminants in air and water (col. 11, line 52; and col. 11, lines 67 to col. 12, line 2). In contrast, claim 312 prescribes to rinsing the contaminants off the surface, not decomposing them. Additionally, Heller relates to "removing contaminant from a fluid stream such as air or water" (col. 59-60) by adhering them to a surface (col. 12, lines 12-15). Claim 312 is just the opposite. Claim 312 prescribes

removing contaminants from the surface by entraining them in the water. Heller does not disclose the claimed limitations relating to hydrophilicity and contact angle less than 20 degrees. In fact, Heller teaches away from rendering a surface hydrophilic by prescribing a binder that renders the surface hydrophobic even when irradiated, so that the surface will "extract organic molecules from fluid, e.g., air or water, concentrating these organic on the coated surface" so that "the organic molecules ... can rapidly diffuse in the coating" (col. 9, 65 to col. 10, line 4) to be degraded (col. 11, line 52). In fact, rendering the Heller's surface hydrophilic (as claimed) would render it less suitable for its intended use (according to Heller) of "extracting contaminants from water" (col. 12, line 13). Regarding contact angle, Heller teaches away from the claimed ranges by stating that the hydrophobic binder preferably increases the contact angle to such an extent that the contact angle is preferably about 90-180 degrees. (col. 9, lines 51-56). This teaches away from the claimed contact angle of less than 20 degrees. Heller's surface would not be inherently hydrophilic, because Heller's method works better with a hydrophobic surface (as explained above) and this is achieved through choice of raw material composition, application method, firing characteristics, and irradiation conditions.

Heller's statements of "virtually self-cleaning" and "to produce photoactive surfaces for the removal of contaminants from fluid" that the Examiner cites refer to a process opposite from that of claim 312. In Heller, "self-cleaning" and "removal of contaminants" refers to cleaning the water and removing contaminants from the water by adhering them to the surface. In contrast, claim 1 as amended describes cleaning the surface and removing contaminants from the surface by entraining them into the water.

As mentioned above, the Examiner offers to remove the abstracts of Nissan Motor Co. LTR and Toyota Motor Corp. as references if Applicants supply a certified translation of the priority application PCT/JP96/00733, and if the PCT application contains all the limitations of the rejected claims. Accordingly, a certified translation of the PCT application is being obtained.

Fukayama relates (as acknowledged by the Examiner) to "environmental purification" to "decompose very small amount of pollutant in a living space" (page 1102, first paragraph). Thus, Fukayama's method removes pollutants from the air by adhering them to a surface for subsequent photocatalytic degradation. This is opposite of the method of claim 312 which removes the contaminant from the surface by entraining it in water. Fukayama does not disclose rendering the surface hydrophilic, reducing the contact angle below 20 degrees, or rinsing the

deposits off the surface (as claim 312 is amended to recited). Rinsing the deposits (as claim 312 is amended to recite) off the surface of Fukayama would render the surface unable to perform its function of photocatalytically decomposing the deposit. Applicants expect that the amendments to claim 312 overcome the Examiner's finding of "no apparent difference between structures produced by Fukayama et al's process, and those of applicant's claims."

In summary, none of the references disclose or suggest all of the limitations of claim 312 as amended. Therefore, claim 312 is patentable over the prior art.

The application should now be in condition for allowance, and allowance is requested.

Respectfully submitted,


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MARKED UP VERSION SHOWING CHANGES MADE

301. (twice amended) A method of preventing or reducing fogging of a surface of a composite when subjected to humid conditions, comprising:

providing a composite with a surface, said composite comprising a substrate and a photocatalytic surface layer, said photocatalytic surface layer comprising a photocatalyst;

subjecting the photocatalyst to photoexcitation to render the surface of the composite hydrophilic, wherein, after said photoexcitation, the surface of the composite has a water wettability of less than 10° in terms of the contact angle with water; and

subjecting the composite to humidity that is sufficient to induce fogging of said substrate if said photocatalytic surface layer were absent.

312. (twice amended) A method for maintaining a surface of a composite in a clean state when subjected to deposits and contaminants in air and environmental precipitation, comprising:

providing a composite with a surface, said composite comprising a substrate and a photocatalytic surface layer, said photocatalytic surface layer comprising a photocatalyst ;

subjecting the photocatalyst to photoexcitation to render the surface of the composite hydrophilic, wherein, after said photoexcitation, the surface of the composite has a water wettability of less than about 20° in terms of the contact angle with water;

subjecting said composite to deposits or contaminants; and

[contacting] washing away the deposits or contaminants on the surface of the composite by occasional contact with water.